

JOHNSON

Automatic Temperature and Humidity

CONTROL

for Heating - Cooling
Ventilating
Air Conditioning
Industrial Processes

JOHNSON SERVICE COMPANY

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HERE IS INFORMATION: Stripped of "sales-talk" and

unnecessary descriptive matter, these pages attempt to present a brief "index" of Johnson apparatus for automatic temperature and humidity control applied to heating, cooling, ventilating, air conditioning, and industrial processes. A Johnson sales engineer will be glad to give you further information. There is no obligation. (See list of branch offices on back cover, page 12.)

SEE TABULAR DESCRIPTIONS: For your

convenience, essential points regarding each device are presented in tables on the following pages, with brief descriptions, in outline form. These descriptions, together with the "Bulletin" numbers and other data indicated in the tables, may be used with confidence in the preparation of specifications.

AIR CONDITIONING.....	Pages 3 & 4	VALVES	Page 8
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ASK FOR BULLETINS: For more detailed in-

formation, APPARATUS BULLETINS will be furnished on request. Some of them are referred to, by number, in this condensed catalog. There are many others, in this interesting and informative series. Simply tell our nearest branch what will be of interest to you.

SEE LIST OF OFFICES ON PAGE 12 (BACK COVER)

≡ THE JOHNSON ORGANIZATION ≡

The JOHNSON SERVICE COMPANY sells apparatus only for installation by its own trained mechanics. There may be other engineers and mechanics who are entirely familiar with automatic temperature regulation. Nevertheless, it is felt that no one will assume such complete responsibility for satisfactory installation as do the manufacturers. When apparatus is sold to others for installation, there is always the likelihood that responsibility will cease when the transaction is closed and the possibility that such concerns may go out of business. The JOHNSON SERVICE COMPANY has been in existence for more than fifty years, will continue to operate, and will take the same interest in a plant that is twenty-five years old as in its most recent installation.

There are twenty-eight direct branch offices in the United States. Each office has an adequate staff, consisting of branch manager, sales engineers, superintendent of installations, clerks, and mechanics. A stock of material for new installations and of parts for repair work is available so that service may be rendered on short notice.

The branch managers and sales engineers are technically trained men, familiar with the work of this company and conversant also with all phases of heating, ventilating, and air conditioning. None of them are agents, jobbers, or part-time representatives. Each is paid a salary and devotes his entire effort to the interests of the JOHNSON SERVICE COMPANY and its customers.

JOHNSON SERVICE COMPANY
MILWAUKEE, WISCONSIN and PRINCIPAL CITIES



MANUFACTURERS - ENGINEERS - CONTRACTORS
AUTOMATIC TEMPERATURE & HUMIDITY CONTROL

JOHNSON CONTROL FOR AIR CONDITIONING

JOHNSON CONTROLS Johnson automatic regulation is the proper solution of the operating problems presented by four of the essential features of a complete air conditioning system: Heating, humidification, cooling and dehumidification. Devices which have been manufactured and installed by the JOHNSON SERVICE COMPANY for fifty years, in one form or another, for the control of temperature and humidity in heating and ventilating installations, find exactly the same uses in modern air conditioning. See pages 5 to 10. Beyond that, the ever-present Johnson policy of "progress" is evident again in the development of many new devices. The result is a complete line of Johnson equipment for every requirement of air conditioning engineers, manufacturers, and contractors.

"SUMMER-WINTER" THERMOSTATS One of the requirements for automatic temperature control for air conditioning systems, is that certain instruments, sensing a rising temperature, must *close* the device which they control, during the heating season, and that those same instruments, on a rising temperature, must *open* those devices during the cooling season. The Johnson "Summer-Winter" room thermostat accomplishes this action. No complicated switching mechanism is required nor are two instruments necessary. Each "Summer-Winter" thermostat is equipped with two sensitive elements: "direct acting" for winter and "reverse acting" for summer. By changing the air pressure in the small compressed air "main" which supplies power to the thermostats, just as is done with the "Dual" thermostat described on page 5, Johnson "Summer-Winter" instruments are indexed from one season to another. The switching is done from a central point by a manually-operated switch or by a pilot thermostat which senses outdoor temperature.

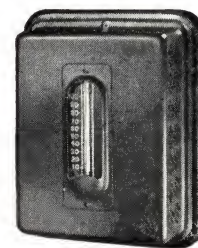
A further interesting feature of the Johnson "Summer-Winter" thermostat is that the temperature setting for heating may be quite different from that for cooling. A separate dial is provided for each of the two sensitive elements. With the usual type of thermostat, this re-adjustment of operating temperature from season to season must be made *at each in-*

dividual instrument. The Johnson "Summer-Winter" thermostat is set permanently at *both* temperatures, and every instrument in the building is shifted from one to the other from a central point and in one operation. See *Bulletin T-311*.

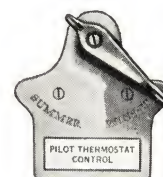
THE "SUMMER-WINTER" INSERTION THERMOSTAT A special form of the Johnson two-point insertion thermostat is provided for use where a duct-type instrument is required to perform the function of a "Summer-Winter" thermostat. Moreover, this form of Johnson insertion thermostat may be arranged for automatic shifting from one cycle to another. For example, acting as a pilot instrument and sensing outdoor temperature, it will arrange the entire temperature regulation system for "control of heating" until the temperature outdoors reaches 68°, change all apparatus to simple "ventilating control" until the temperature rises to 75°, and then shift to "cooling control" for higher outdoor temperatures. Many other applications for this unique device are readily apparent.

DIFFERENTIAL THERMOSTAT A great contribution to the science of air conditioning is the Johnson "Differential" thermostat. It is accepted by most authorities that it is preferable to maintain indoor conditions, by means of cooling systems, at temperatures which bear a "sliding relationship" to the outdoor temperature. The general consensus of opinion is that a temperature of 72° indoors is desirable when the outdoor temperature is 70°, rising, as the outdoor temperature increases, until cooling to about 80° is sought when it is 95° outdoors.

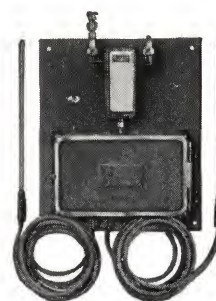
The Johnson "Differential" thermostat maintains that relationship. Further than that, it is adjustable, so that any desired relationship between the temperatures at two different points may be secured. In air conditioning work, one bulb of the "Differential" thermostat is mounted in a suitable location to sense the outdoor temperature, while the other bulb is located where it will sense the temperature in the conditioned space, usually measured most conveniently in a "circulating duct." The "Differential" thermostat is described in *Bulletin T-304*.



SUMMER-WINTER THERMOSTAT



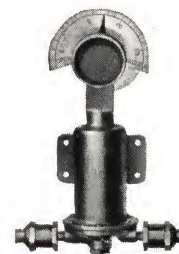
SUMMER-WINTER SWITCH



DIFFERENTIAL THERMOSTAT



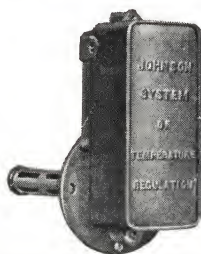
REMOTE-READJUSTABLE SUMMER-WINTER THERMOSTAT



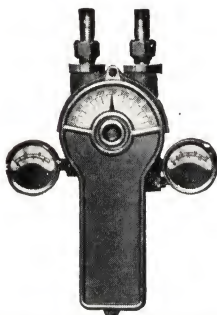
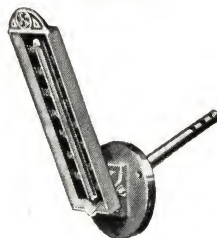
RE-ADJUSTING SWITCH



INSERTION AND IMMERSION THERMOSTATS



INSERTION THERMOSTAT

FOUR-POINT MULTIPLE
INSERTION THERMOSTATCALIBRATED IMMERSION
THERMOSTAT"SUNRISE"
DUCT THERMOMETER

TYPES: Standard Johnson insertion and immersion thermostats are shown in tabulation below. Special types available for air conditioning and process control, some of which are described on pages 3 and 4. Sensitive elements arranged for insertion through walls or into ducts and for immersion in tanks. Operating mechanism located outside, for ready adjustment and observation.

THERMOSTATIC ELEMENT: Invar rod enclosed in brass tube, perforated for control of air and other gases, solid for immersion in liquids. Maximum temperature 250° F.

KIND OF ACTION: Intermediate (gradual) for operation of dampers, throttling valves, etc. Positive (snap-action) for rapid movement, fully open to tightly closed.

TEMPERATURE ADJUSTMENT: (1) "Closed adjustment," with knob beneath cover, to prevent tampering, (2) "Open

adjustment" with knob extending through cover and dial visible through window. Although all Johnson insertion and immersion thermostats have adjusting dials marked in degrees, some types (designated below as "Calibrated") have larger, easily-read dials for use where frequent and very accurate re-setting is required, as in process work.

SENSITIVITY: See tabulation below, expressed in terms of pressure change in branch line leading to controlled device for a change of one degree, F., in temperature sensed. For discussion of selection of proper sensitivity, see page 4. All "supersensitive intermediate" instruments equipped with adjustable sensitivity.

COVERS: "Model Calibrated"—5 $\frac{3}{16}$ " high, 2 $\frac{7}{16}$ " wide, 1 $\frac{3}{8}$ " thick. $\frac{1}{2}$ " pipe thread. All other immersion types—6 $\frac{1}{8}$ " high, 2 $\frac{7}{16}$ " wide, 2 $\frac{5}{8}$ " thick. 1" pipe thread. Insertion types—Same, with mounting flange 4" diam.

THERMOMETERS

"SUNRISE" INSERTION THERMOMETERS: Illustrated on this page. A high grade mercury thermometer for insertion into sheet metal ducts or through walls. A flange is provided so that the thermometer may be fastened to the wall or duct with screws. Made only in the angle pattern. A patented arrangement allows tilting through an angle of 45 degrees so that the scale of the instrument is readable even though mounted above the line of vision. Scales of various ranges of temperatures from -20° to 400° F. Shanks for duct mounting or for insertion through walls up to 24" thick.

"SUPERSENSITIVE" INSERTION THERMOMETERS: A high grade mercury thermometer for insertion into sheet

metal ducts or through walls. Large V-shaped scale, tilted slightly, with magnifying tube, and screwed flange for mounting. Has a larger scale than the "Sunrise" thermometer, is generally more appropriate for high class engine rooms. Scales 30° to 240° or -20° to 120° F. Shanks for duct mounting or for walls up to 30" in thickness.

IMMERSION THERMOMETERS: Mercury column. Scale 6" long, $\frac{1}{2}$ " male pipe thread. Straight stem type, 40° to 240° F. with 1 $\frac{3}{16}$ " shank. Angle type in various ranges from -20° to 260° F. and with shanks up to 12" in length.

DIAL THERMOMETERS: Various types of dial thermometers are supplied where that type is preferred.

PRINCIPAL TYPES OF INSERTION AND IMMERSION THERMOSTATS

Bulletin	Types	Kind of Action	Sensitivity	Length of Stem
T-316	Unit Insertion	Supersensitive Intermediate	Adjustable $\frac{1}{2}$ to 8 lbs.	6 $\frac{1}{4}$ " to 49 $\frac{1}{16}$ "
T-318	Unit Insertion	Positive (Snap-Action)	$\frac{1}{2}$ Deg. Differential	6 $\frac{1}{4}$ " to 49 $\frac{1}{16}$ "
T-350	Multiple Insertion (2, 3, 4 pt.)	Positive, Int. or Combined	Same as T-316 and 318	7 $\frac{1}{2}$ " to 25 $\frac{1}{2}$ "
T-320	Unit Airstream	Intermediate	Adjustable $\frac{1}{4}$ to 4 lbs.	19 $\frac{1}{16}$ "
T-317	Unit Immersion	Supersensitive Intermediate	Adjustable $\frac{1}{2}$ to 8 lbs.	7 $\frac{3}{16}$ " to 43 $\frac{1}{16}$ "
T-319	Unit Immersion	Positive (Snap-Action)	$\frac{1}{2}$ Deg. Differential	7 $\frac{3}{16}$ " to 43 $\frac{1}{16}$ "
T-351	Multiple Immersion (2, 3, 4 pt.)	Positive, Int. or Combined	Same as T-317 and 319	6 $\frac{1}{2}$ " to 24 $\frac{3}{4}$ "
T-326	"Model" Calibrated	Standard Intermediate	10 lbs. per deg.	14"
T-349	Calibrated	Standard Intermediate	5 lbs. per deg.	13 $\frac{5}{16}$ "
T-348	Calibrated	Positive (Snap-Action)	$\frac{1}{2}$ Deg. Differential	13 $\frac{5}{16}$ "



HUMIDITY CONTROL

HUMIDOSTATS

TYPES: Standard Johnson humidostats, both room and insertion types, are tabulated below. Remotely adjusted patterns for air conditioning control are described on pages 3 and 4. Humidostats sense relative humidity in the same manner that thermostats re-act to temperature and are equally dependable. Insertion humidostats are used to sense conditions in ducts and other chambers; room patterns for wall mounting in humidified spaces.

Johnson "Comfostats" are thermostats in which the temperature setting is re-adjusted by a humidity element. Room type (*Bulletin T-408*). Insertion type (*T-409*).

HUMIDOSTATIC ELEMENTS: Several types: bi-wood strips, animal membrane, multiple strands of human hair. Temperature and humidity limitations for each are tabulated below.

KIND OF ACTION: Intermediate (gradual) for modern heating, ventilating and air conditioning systems. Operate valves or dampers gradually, or hold them in intermediate positions to maintain humidities within one percent, if desired. Positive (snap-action) for "single-pipe" systems or high steam pressure, where rapid movement, fully open to tightly closed, is required.

HUMIDITY ADJUSTMENT: Room types—Same as described for "TEMPERATURE ADJUSTMENT" of room thermostats, page 5. Insertion types—Same as insertion thermostats, page 6. Adjusting dials have various ranges for different instruments. See tabulation below.

SENSITIVITY: See tabulation below, expressed in terms of pressure change in branch line leading to controlled device for a change of one percent in relative humidity.

COVERS: Same as for room and insertion thermostats, pages 5 and 6.

HUMIDIFIERS

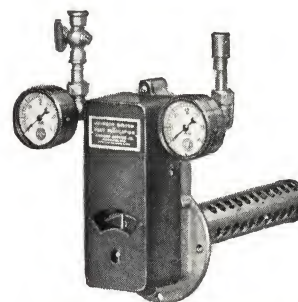
Johnson humidifiers have been in successful operation for many years in connection with ventilating and blast heating. The "grid" type has several branches of perforated pipe, wrapped with wicking. Low pressure steam moistens the wicking whenever the automatically controlled valve is open. The "pan" type humidifier is a brass steam coil immersed in a water-pan of copper with automatic float control. Humidity is controlled by humidostatic operation of a valve on the steam supply. Steam does not come in contact with the air. *Bulletins H-201 and 202.*

WET-BULB ATTACHMENTS

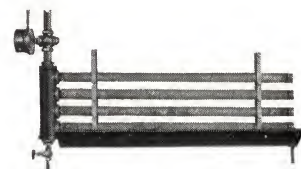
All types of Johnson insertion, immersion, and extended tube thermostats become "wet-bulb" thermostats when fitted with any of the various Johnson wet-bulb attachments. These attachments are of two types; wick or alundum tube, with or without circulating fans. All are described in *Bulletin H-310*. Johnson manufactures a relative humidity indicator (*Bulletin H-301*), a whirling hygrometer (*H-303*), and a psychrometer with circulating fan (*H-302*), all designed for accurate reading of relative humidity.



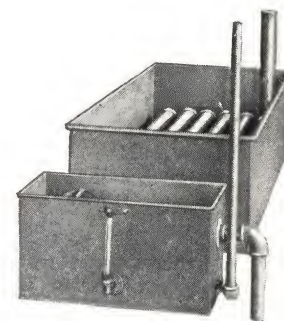
ROOM HUMIDOSTAT



INSERTION HUMIDOSTAT



GRID HUMIDIFIER



PAN HUMIDIFIER

PRINCIPAL TYPES OF ROOM AND INSERTION HUMIDOSTATS

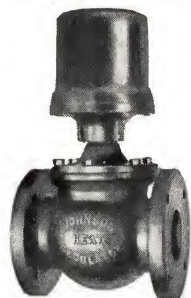
Bulletin	Type	Kind of Action	Sensitivity	Element	Humidity	Maximum Temperature	Dial Range
H-102	BW Room	Supersensitive Intermediate	1 1/2 lbs. for each %	Bi-wood	10 to 60%	95°	30%
H-103	G Room	Supersensitive Intermediate	1 lb. for each %	Membrane	Up to 95%	110°	20%
H-105	BW Room	Proportioning Intermediate	Adjustable 1/4 to 6 lbs.	Bi-wood	10 to 60%	95°	30%
H-155	W Insertion	Standard Intermediate	12 lbs. for each %	Wood cylinder	10 to 70%	150°	15%
H-153	H Insertion	Standard Intermediate	5 lbs. for each %	Multiple hair	Up to 95%	175°	20%
H-154	H Insertion	Supersensitive Intermediate	Adjustable 1 to 10 lbs.	Multiple hair	Up to 95%	175°	20%
H-151	G Insertion	Standard Intermediate	5 lbs. for each %	Membrane	Up to 95%	110°	20%
H-152	G Insertion	Supersensitive Intermediate	Adjustable 1 to 10 lbs.	Membrane	Up to 95%	110°	20%
H-156	W Insertion	Positive (Snap-action)	1% Differential	Wood cylinder	10 to 70%	150°	15%



VALVES



RADIATOR VALVE

COIL VALVE
("SYLPHON" DIAPHRAGM)MIXING VALVE
(RUBBER DIAPHRAGM)BY-PASS VALVE
("SYLPHON" DIAPHRAGM)

TYPES: Johnson diaphragm valves are simple, rugged devices without complicated moving parts. Dependable diaphragms, built for long, uninterrupted service, operate the valve stem by means of air pressure transmitted through a branch line leading from a Johnson thermostat, humidostat, or switch. Strong, heavy springs of various pressure characteristics, as required, operate the valves in the opposite direction. There is no line of diaphragm valves as complete as that offered by Johnson: for steam, water, brine, ammonia, compressed air, and other liquids and gases.

SIZES AND PATTERNS: All standard sizes, as shown in tabulation below. Direct-acting "radiator valves" available in angle, globe, offset, corner, and straight corner: Direct-acting "coil valves" in angle and globe patterns: All others, globe pattern only.

KIND OF ACTION: Direct-acting "normally open," reverse-acting "normally closed," three-way mixing, three-way by-pass. Balanced types for high pressures.

SPRINGS: Strong springs of proper characteristics for pressure and type of service required.

DIAPHRAGMS: The seamless metal bellows in Johnson "Sylphon" valves was the first practical and reliable metal diaphragm adapted to automatic temperature control devices. The "Sylphon"

diaphragm is especially desirable for valves in radiator enclosures and other locations where other materials might be affected by high temperatures . . . For those applications where a rubber diaphragm is desired, Johnson manufactures valves with diaphragms of special moulded rubber, super-aged and heat-resistant. The totally enclosed construction prevents corrosive action of fumes, keeps dirt away from internal parts.

DISCS: Various types of composition or metal discs are provided to suit the particular service which each valve is to perform. The special modulating disc in Johnson "streamline" valves produces throttling control and is valuable for all applications where modulating action is desirable.

BODIES AND SEATS: In the smaller sizes, valve bodies are high grade steam bronze metal with seat machined integral with the body. Large valves are cast iron with screwed-in seat ring of bronze. For high-pressure service and special applications, valves with monel metal or stainless steel trim are supplied.

FINISH: "Radiator valves" in nickel or chromium plate. Other valves, 2" and smaller, plain brass bodies with tops dull black lacquer. Larger valves, iron bodies, black lacquer, overall.

CONNECTIONS: In general, all valves of sizes 2" and smaller are for screwed connections and "radiator" types are provided with male union on outlet. Larger valves are available for either screwed or flanged connections.

DIAPHRAGM VALVES

Bulletins and Sizes			Type	Action	Service	Diaphragm	
V-351	½" to 1½"	V-352	2" to 12"	Balanced	Direct	Steam or Liquids	Sylphon
V-353	½" to 2"	V-354	2½" to 12"	Balanced	Reverse	Steam or Liquids	Sylphon
V-175	½" to 2"	.....	.....	Brine	Direct	Brine	Sylphon
V-93	½" to 2"	.....	.....	Brine	Direct	Brine	Rubber
V-178	½" to 2"	.....	.....	Brine	Reverse	Brine	Sylphon
V-91	½" to 2"	.....	.....	Brine	Reverse	Brine	Rubber
V-135	½" to 2"	V-136	2½" to 6"	By-pass	3-way	Liquids	Sylphon
V-99	½" to 6"	.....	.....	By-pass	3-way	Liquids	Rubber
V-125	½" to 2"	V-126	2½" to 6"	Mixing	3-way	Liquids	Sylphon
V-107	½" to 2"	V-108	2½" to 10"	Mixing	3-way	Liquids	Rubber
V-110	½" to 2"	V-112	2½" to 8"	Radiator and Coil	Direct	Steam	Sylphon
V-111	½" to 2"	V-113	2½" to 8"	Radiator and Coil	Direct "Streamline"	Steam	Sylphon
V-101	½" to 2"	V-102	2½" to 8"	Radiator and Coil	Direct	Steam	Rubber
V-103	½" to 2"	V-104	2½" to 8"	Radiator and Coil	Direct "Streamline"	Steam	Rubber
V-114	½" to 2"	V-115	2½" to 8"	Radiator and Coil	Reverse	Steam	Sylphon
V-105	½" to 8"	.....	.....	Coil	Reverse	Steam	Rubber
V-150	½" to 2"	V-151	2½" to 8"	Radiator and Coil	Direct	Liquids	Sylphon
V-97	½" to 8"	.....	.....	Coil	Direct	Liquids	Rubber
V-155	½" to 2"	V-156	2½" to 8"	Radiator and Coil	Reverse	Liquids	Sylphon
V-95	½" to 8"	.....	.....	Coil	Reverse	Liquids	Rubber



DAMPERS

TYPES: Johnson dampers are "made to measure" in all sizes and in every known type, the most common of which are tabulated below.

Used widely for the regulation of air flow in ducts. The "proportioning louver" type of damper has been developed especially for air conditioning applications, adjacent blades rotating in opposite directions, reducing the quantity of air flowing without deflecting its course.

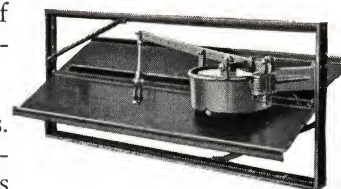
MATERIALS: Standard dampers have No. 16 gauge hot-rolled steel blades with flat steel frames and bracing sufficiently heavy to form a rigid assembly. Angle iron frames optional. Made also of galvanized iron, monel metal, aluminum, copper, rust resisting steel, etc. Blades and frames may be of different materials.

FINISHES: Standard is two coats of black lacquer. Special corrosion-resisting finishes on order.

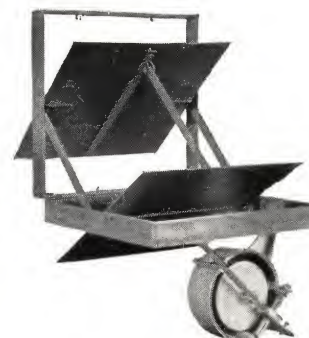
BEARINGS: Brass pins in steel bearings. Also ball bearings, all bronze, or cadmium plated steel ball races and stainless steel balls.

STOPS: Solid "lip", continuous on all sides of damper, or "pin stops," if preferred. Felted stops for quiet operation, on special order.

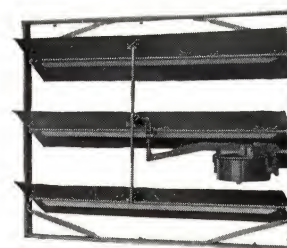
SIZES: Made to exact dimensions for each application. Louvered (multi-blade) construction recommended for all cases where single blade would exceed 12" in width. Intermediate bearing and frame-stiffener when axis exceeds 80" in length.



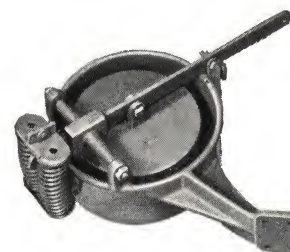
SINGLE-LEAF DAMPER



RIGHT ANGLE MIXING DAMPER



LOUVERED DAMPER

DAMPER MOTOR
("SYLPHON" DIAPHRAGM)DOUBLE DIAPHRAGM
DAMPER MOTOR
(PILOT TYPE)

DAMPER MOTORS

Johnson damper motors, as simple and dependable as diaphragm valves, are capable of long service without attention of any sort.

"Sylphon" seamless metal or rubber diaphragm operates a lever attached to the damper by suitable linkage. Various types of brackets are provided, including

a large variety of special patterns for all makes of unit ventilator cabinets.

The "double - diaphragm," pilot - type of damper motor can be depended upon to place a damper in a certain position and to hold it there, on each cycle of operation, for a given temperature sensed by the controlling instrument.

DAMPERS

Bulletin	Type
D-201	Double Mixing
D-203	Louvered
D-225	Proportioning Louver*
D-204	Round
D-202	Single-leaf

DAMPER MOTORS

Bulletin	Type
D-101	No. 1 & 2 "Sylphon"
D-103	No. 3 "Sylphon"
D-104	"Sylphon" Unit Ventilator
D-301	Rubber Diaphragm
D-401	Double Diaphragm Pilot Type

* Adjacent blades rotate in opposite direction for "proportioning" of air flow.

SWITCH CONTROL

Johnson pneumatic switches are made in many patterns for the operation of dampers from a remote point, for changing "Dual" thermostats from "day to night," and for placing thermostats and other devices in and out of service, as required.

Standard Johnson switchboards are made of oiled slate. Ebony asbestos, polished oak, and genuine or imitation marble are available on order. Various Johnson devices required at a central control point are mounted on such switchboards, including lever-type switches, gradual

switches, clocks, air pressure gauges, recording gauges, etc.

SWITCHES

Bulletin	Type
S-101	Switchboards
S-201	Three-way Switch
S-203	Three-branch Throwover
S-205	Three-branch Three-way
S-215	Three-branch Four-way
S-217	Special Three-branch
S-209	Four-branch, Four-way
S-219	Multiple-step
S-220	Gradual
V-15	Single Solenoid for Air
V-14	Double Solenoid for Air
G-201	Air Pressure Gauges

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MANUFACTURERS - ENGINEERS - CONTRACTORS
AUTOMATIC TEMPERATURE & HUMIDITY CONTROL

PNEUMATIC CLOCKS



DAY-NIGHT CLOCK



SEVEN-DAY PROGRAM CLOCK



COMBINED 24-HOUR AND 7-DAY CLOCK

Johnson pneumatic clocks are driven by Telechron self-starting single-phase synchronous motors and are for operation by alternating current where the frequency is controlled accurately. For direct or for alternating current not properly controlled, electrically wound, spring-driven Johnson clocks are furnished. Each clock operates a pneumatic relay so that compressed air is placed in or exhausted from the "branch line" at certain intervals, for the operation of other Johnson devices. The principal use of these clocks is to change Johnson "Dual" thermostat control systems and Johnson zone control systems from day to night operation. There are many other applications where the operation of various devices is required at certain times. Johnson "Periodic Flush" systems (*Bulletin*

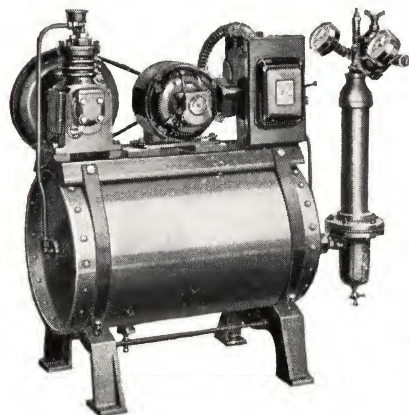
C-301) offer remarkable economies. The "Day-Night" or 24-hour clock (*Bulletin C-302*) is used where the same operating program is repeated daily, "on" and "off." The "night" interval may be adjusted for any period between eight and sixteen hours.

The "24-hour and 7-day" clock (*Bulletin C-303*) also repeats the same program daily, but an additional dial provides interruption of the daily cycle for week-end service, for any period from 24 to 48 hours, every seven days.

The "Program Clock" (*Bulletin C-304*) permits a different operating program for each day of the week. The dial makes one revolution every seven days and is equipped with segments to allow successive operations each day at intervals of not less than fifteen minutes.

AIR COMPRESSORS

Johnson temperature control devices use compressed air at fifteen pounds pressure. Each device uses very little air, and a small compressor is amply large for an extensive control system. Johnson compressors represent the best in machine design and manufacture. They are automatic in operation and require no attention beyond ordinary care in oiling and cleaning.

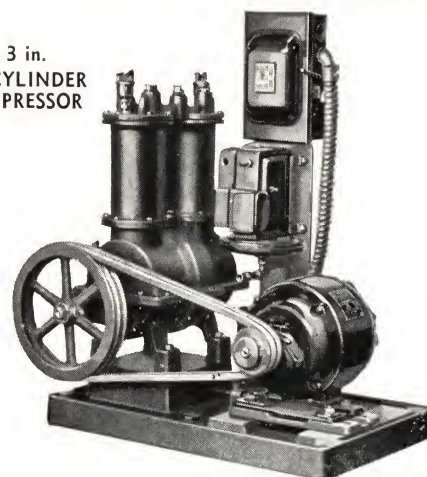


10

2 in. "UNIT-TYPE"
AIR COMPRESSOR

Each compressor is equipped with pressure governing switch, over-load time protective fuse plugs, enclosed safety knife switch, high grade electric motor, and V-belt drive. Unit-type assemblies include storage tank, pop safety valve, air filter, reducing valve, and gauges.

3 in. x 3 in.
DOUBLE CYLINDER
AIR COMPRESSOR



Size of Compressor	No. of Cyl.	Capacity Cu. Ft. Free Air per Min.	Storage Tank, Gallons	Horsepower of Motor	Bulletin
2" AA-5 ...	1	0.61	5*	1/8	A-303
2" A	1	0.61	10*	1/8	A-300
2" B	1	1.13	25*	1/8	A-301
3" x 3" ...	2	2.55	30*	1/4	A-302
4" x 4" B ...	2	4.98	†	1/2 or 3/4 ‡	A-307
4" x 4" C ..	2	6.31	†	3/4 or 1 ‡	A-307

* Made also without tank and stand. † Storage tank mounted separately. Not made in "unit-type." ‡ Larger motors when governors are set for 22 to 30 lbs.



JOHNSON ZONE CONTROL SYSTEMS

ZONE HEATING The piping system which distributes steam—or hot water—to the radiators in a building may be laid out with such mains and branches that various sections may be served independently. It is not at all unusual to find a similar arrangement of piping in existing buildings, facilitating the application of "zone control." In many buildings, a single riser or a group of adjacent risers may be considered as the steam distributing system for a "zone." In other cases, it is easy to make slight changes in the piping arrangement so that satisfactory "zoning" is had.

Many attempts have been made to utilize a single thermostat to control a group of radiators. JOHNSON, as exclusive licensees under various F. I. Raymond patents, manufactures and installs the "Duo-Stat" as the logical answer to the question, "Where shall the thermostat be placed to control an entire heating zone?"

ECONOMY OF CONTROL FROM OUTDOOR TEMPERATURE

Radiators of sufficient heating capacity are provided to combat the coldest weather usually encountered in the locality. Consequently, only a part of that capacity is required during normally cold weather, and a very small fraction on mild days. Changing the amount of effective radiating surface in accordance with the outdoor temperature *has been* a difficult problem.

VARYING THE RADIATOR TEMPERATURE To illustrate the saving possible by reducing radiator temperatures as weather conditions moderate, it is safe to assume that an average outdoor temperature of about 45 degrees might be expected during the heating season in a locality where the amount of radiating surface is computed from a base temperature of 0 degrees. With a 45-degree temperature rise above zero, the required radiator temperature will be 90 degrees less than the full radiator at 210, or 120 degrees for comfortable conditions on an *average* heating day.

THE JOHNSON DUO-STAT

RADIATORS PARTIALLY FILLED The Johnson Duo-Stat operates according to the relationship between outdoor and radiator temperatures. Since the temperature of steam is approximately 210 de-

grees, it is not easy to produce a temperature lower than that throughout a radiator. However, the same result is accomplished if steam is kept in only a part of the radiator. It is found that the operation of any good one-pipe or two-pipe steam or vapor heating sys-

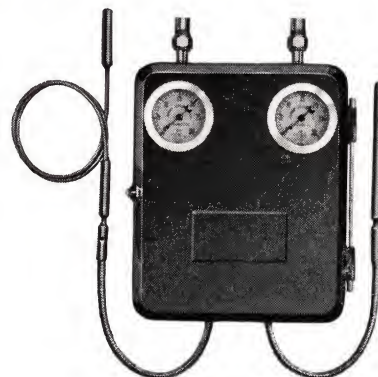
tem can be controlled from a thermostatic bulb attached to one radiator in such a way that all radiators are kept partially filled with steam in mild weather. Moreover, a peculiar type of operation is obtained which tends to produce the same proportion of filling in all the radiators.

The Johnson Duo-Stat is equipped with two sensitive elements. One of the elements is placed outdoors. The other is clamped securely to a radiator, preferably to the last radiator at the end of the longest steam main in the particular heating zone. As a matter of fact, for steam, vapor or vacuum heating systems, the radiator bulb is divided into four sections, so that they may be placed advantageously to sense the average temperature of the heated and unheated portions of the radiator.

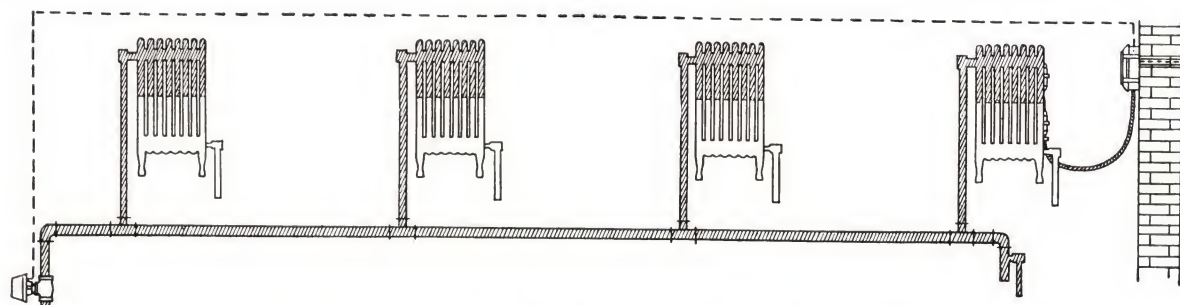
EVEN DISTRIBUTION OF STEAM

UNIFORM TEMPERATURE Room temperatures under Duo-Stat control are surprisingly uniform, with neither overheating nor waste of fuel. Even distribution of heat throughout each zone is possible because Duo-Stat control, from the relationship between outdoor and radiator temperatures, overcomes the disadvantage of cold steam mains by turning the steam on so often that the lines stay hot, and supplies steam to the system at sufficient pressure, whenever steam is required, to reach even the last radiators.

The booklet, "Johnson Zone Control," covers completely the applications of Johnson Duo-Stats for zone control.



JOHNSON DUO-STAT



TYPICAL DISTRIBUTION OF STEAM UNDER DUO-STAT CONTROL

BRANCH OFFICES

Albany, N. Y.....13 Northern Blvd.
Atlanta, Ga.....813 Bona Allen Bldg.
Baltimore, Md.....911 Cathedral St.
Boston, Mass.....20 Winchester St.
Buffalo, N. Y.....503 Franklin St.
Chicago, Ill.....1355 Washington Blvd.
Cincinnati, Ohio.....1113 Race St.
Cleveland, Ohio.....2142 E. 19th St.
Dallas, Texas.....2505 Commerce St.
Denver, Colo.....1230 California St.
Des Moines, Iowa.....1217 Grand Ave.
Detroit, Mich.....427 Brainard St.
Greensboro, N. C.....105 Piedmont Bldg.
Indianapolis, Ind.....333 N. Pennsylvania St.
Kansas City, Mo.....1031 Wyandotte St.
Los Angeles, Calif.....153 West Avenue, 34
Milwaukee, Wisc.....507 E. Michigan St.
Minneapolis, Minn.....922 Second Ave., South
New York, N. Y.....28 E. 29th St.
Oklahoma City, Okla.....1100 N. W. 38th St.
Philadelphia, Pa.....2853 N. 12th St.
Pittsburgh, Pa.....1238 Brighton Road
Portland, Ore.....1312 N. W. Raleigh St.
St. Louis, Mo.....2328 Locust St.
Salt Lake City, Utah.....602 Dooly Bldg.
San Francisco, Calif.....814 Rialto Bldg.
Seattle, Wash.....514 Colman Bldg.
Washington, D. C.....300 Bond Bldg.

Johnson Temperature Regulating Company of Canada, Ltd.

Calgary, Alb.....605 Second St., W.
Montreal, Que.....4343 Melrose Ave.
Toronto, Ont.....113 Simcoe St.
Vancouver, B. C.....550 Sixth Ave., W.
Winnipeg, Man.....259 Stanley St.

JOHNSON SERVICE COMPANY
Milwaukee, Wisconsin